

**BEFORE INDEPENDENT HEARING COMMISSIONERS APPOINTED BY
THE CANTERBURY REGIONAL COUNCIL**

IN THE MATTER OF The Resource Management Act 1991

AND

IN THE MATTER OF Submissions and further submissions by Irrigation
New Zealand on Proposed Plan Change 5 to the
Canterbury Land and Water Regional Plan

STATEMENT OF EVIDENCE OF ANDREW ROBERT CURTIS

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STATEMENT OF EVIDENCE OF ANDREW CURTIS

Introduction

- 1 My name is Andrew Curtis. I am the Chief Executive of Irrigation New Zealand Incorporated (**INZ**) since July 2009.
- 2 I hold an upper second class BSc (Hons) degree (Physical Geography and Environmental Biology) from Oxford Brookes University and a PGDip (Environmental Management) from the University of Surrey. I also hold a New Zealand National Certificate in Irrigation Evaluation, and Massey University Certificates of Completion in Sustainable Nutrient Management in New Zealand Agriculture for both Intermediate and Advanced courses.
- 3 My experience and knowledge of irrigation in New Zealand (**NZ**) is considerable, in terms of both land uses (pastoral through horticulture and viticulture) and irrigation systems (drip-micro and spray). Whilst at INZ I have co-authored the irrigation industry code of practices and standards for design, installation and evaluation, and the irrigation manager and development training resources. I have also published a number of papers on the history, current extent and future development of irrigation in NZ. I was also the owner operator of a vineyard in Hawke's Bay and successfully managed both a frost protection and drip irrigation system for eight years.
- 4 I have much recent experience in the area of water policy development. For example, as a representative of INZ I am actively involved in the Land and Water Forum process - plenary, small group and working groups, since 2009.
- 5 My previous NZ work experience includes six years employment with Hawke's Bay Regional Council, initially as an extension officer with a focus on irrigation and then as Strategic Advisor – Water. In this role I helped lead the development of the Hawke's Bay regional water strategy. This had a strong non-regulatory focus (including water storage, water user groups, water metering) to complement and better enable traditional regulatory pathways.

- 6 Prior to my employment with Hawke's Bay Regional Council I was employed in a variety of horticultural roles in NZ, and a cropping / sheep and beef farm management role in the United Kingdom.
- 7 My evidence relates to Schedule 28 of Plan Change 5 (**PC5**) to the Land and Water Regional Plan (**LWRP**) and the rule for "Irrigation and water use" (**Irrigation Rule**).
- 8 I am authorised to give this evidence on behalf of INZ.

Scope of Evidence

- 9 In my evidence I will -
 - 9.1 Explain why INZ has chosen to participate in PC5;
 - 9.2 Describe INZ's participation in the Matrix of Good Management Project (**MGM Project**) and development of the September 2015 'Industry-agreed' Good Management Practices (**GMPs**);
 - 9.3 Describe INZ's participation in the development of Schedule 28 generally and the Irrigation Rule specifically;
 - 9.4 Outline the consideration of providing equity between irrigators;
 - 9.5 Put forward the new Irrigation Rule for Schedule 28; and
 - 9.6 Respond to relevant aspects of Appendix D of the s42A Report.

INZ's involvement in PC5

- 10 INZ is a national body that promotes excellence in irrigation. INZ represents the interests of over 3,600 irrigators (irrigation schemes and individual irrigators - the majority of these being in Canterbury) totalling over 360,000 ha of irrigation (over 50% of NZ's irrigated area). It also represents the interests of the majority of irrigation service providers (over 150 manufacturers, distributors, design and install companies and consultancies).
- 11 An irrigator's business is founded on certainty. This includes access to a reliable water supply for irrigation and the ability to farm their land with a degree of flexibility. It is this certainty that enables investment and continuous improvement in resource use efficiency. Without

certainty they and the considerable flow-on benefits to the regional economy can be significantly impacted. The national economy would also be impacted upon given NZ is an agricultural export based economy. Irrigated produce currently contributes between 1 - 1.5% to national GDP.

- 12 The majority of INZ's activities are now focussed around the provision of knowledge and training opportunities for irrigators (both members and non-members). INZ holds a comprehensive set of knowledge resources for developing, operating and maintaining irrigation systems. During 2015-16 INZ ran 38 training courses attended by over 450 individuals. The majority of these were for irrigators with a focus upon how they achieve GMP. INZ has developed a framework for this called SMART Irrigation. This is outlined in **Appendix 1** of my evidence.
- 13 INZ perceives PC5 to be precedent setting for the NZ irrigation sector. INZ considers the GMP irrigation rules within Schedule 28 will be viewed as establishing minimum performance expectations for irrigators and their service industries – they define GMP for irrigation. INZ therefore sees it as important that the rules are practical and achievable. They need to represent actual good management practice in the field, whilst establishing an equitable bottom-line for irrigation performance throughout red, orange and green zones as well as between irrigation system types and different land uses. INZ understands it is for individual sub-regional or catchment planning processes to deliberate upon the need to lift the bar further, for example when exploring potential mitigation options as part of the limits setting process. This may then include a requirement for the capital upgrade of existing systems.
- 14 INZ has focussed its expert evidence upon the Schedule 28 Irrigation Rule as this is where our expertise lies. However, it maintains the appropriateness of other outcomes, including in particular the “alternative pathway” being put forward by the evidence of *Gerard Willis* for Fonterra. INZ believes there is a need to provide an alternative consenting pathway for those who can demonstrate they are achieving the industry-agreed GMP's though an audited Farm

Environment Plan, but their OVERSEER nitrogen loss calculation is greater than that generated by the Farm Portal.

- 15 Whilst further refinement of the Irrigation Rule should help to minimise the incidence of this, it should be recognised that all models have limitations and there will be genuine exceptions that need to be catered for. The current prohibited activity rule does not provide for this. INZ therefore supports the planning evidence of *Gerard Willis* around providing an alternative pathway.

INZ's participation in the MGM Project

- 16 INZ's involvement within the MGM project has been through the governance group and also through staff member involvement in the reference group. However, INZ has had no direct representation on the project management group or the project development group.
- 17 INZ's input into the 'industry-agreed' GMP's for irrigation was made indirectly through the primary sector representative groups. INZ put forward its SMART Irrigation framework, developed over the last decade by irrigators and their service industries, for the primary sector groups to provide to the project development group. SMART Irrigation was released in early 2014 as a framework for the practical implementation of Irrigation GMP. An overview of the expectations for SMART Irrigation are provided in **Appendix 1**.
- 18 The intent and some components of the SMART Irrigation framework have been picked up and in part reproduced as implementation guidance within the 'industry-agreed' GMP's document.
- 19 INZ therefore approved, actively supported and continues to promote the 'industry-agreed' GMP's document in combination with SMART Irrigation.

INZ's participation in Schedule 28

- 20 Schedule 28 and Method s28.4 contain the Irrigation Rules that are derived from the industry-agreed GMP's document. A technical group, consisting of scientists, was formed to develop these modelling rules and the farm portal within which they are used. INZ had no direct involvement in this technical group.

- 21 During June, July and August of 2015, INZ requested a discussion with the technical group on four occasions, offering to pull together a group of expert practitioners and irrigation management service providers to help them develop practical irrigation rules for the Farm Portal. Unfortunately, this offer of assistance was not taken up and instead INZ was sent an e-mail that provided an overview of the technical group's interpretation of the irrigation GMP's and the resulting modelling rules. INZ subsequently disputed both the group's interpretation of the irrigation GMP's and the modelling rules as we felt they did not reflect the industry agreement and were also not achievable.
- 22 The key issue was a differing interpretation of the first irrigation GMP – *Manage the amount and timing of irrigation inputs to meet plant demand and minimise risk of leaching and run-off*. The technical group interpreted this to effectively mean no leaching or run-off occurs from each irrigation application or 100% application efficiency. 100% application efficiency is not a realistic assumption for GMP irrigation.
- 23 INZ interprets the first irrigation GMP to require reduction of drainage from the root zone in the context of managing production risk (minimising the time for which the plant encounters water stress). Having asked, I am satisfied this viewpoint is supported by the primary sector groups directly involved in the MGM project.
- 24 INZ interprets the second irrigation GMP – *Design, calibrate and operate irrigation systems to minimise the water needed to meet production objectives* – is to ensure existing irrigation infrastructure performs at its optimum. INZ did not understand the purpose of the agreed GMP's was to drive extensive investment in upgrading irrigation infrastructure. There is no text within the irrigation GMP or its implementation guidance that implies an expectation of significant capital upgrade.

- 25 This viewpoint is supported by page 16 of the DairyNZ MGM technical report¹:

“The relatively short term for implementation of GMP on all farms (June 2017) and the understanding that GMP should not impact negatively on economic viability of farms, meant that it was generally understood that GMP would not require substantial farm system changes, nor large capital investments”.

- 26 INZ anticipates any additional improvements or investment will be driven by the requirements of sub-regional plans. A catchment may be so over-allocated that significant reductions (beyond GMP) are required. Irrigators may have to make significant investment in irrigation systems and technology in order to achieve the required reductions.
- 27 INZ agrees there are some circumstances where irrigation is being applied well in excess of soil plant available water, and in such instances there should be an expectation of irrigation infrastructure upgrade under irrigation GMP. These scenarios are outlined in the evidence of *Ian McIndoe*.
- 28 After INZ raised concerns around the irrigation rules, and in combination with the other issue of the fertiliser modelling rule, the MGM project was given an extension to its timeline. The technical group agreed to meet with a group of irrigation experts in September 2015 to discuss the irrigation rules. At this meeting INZ understood there was agreement around the “travelling irrigator rule” being universally applied and the concept of an 80% application efficiency modelling approach was raised for this. Unfortunately, there was no confirmation of this post meeting.
- 29 Prior to that meeting there were a number of e-mail exchanges including INZ providing a draft table of irrigation rules for discussion. These were not finalised or agreed for use. Despite this, parts of the table seem to have now appeared in Method s28.4. However, the rules

¹ http://ecan.govt.nz/publications/General/MGM_Dairy_Technical_report_final.pdf

in Schedule 28 and Method s28.4 are different from what INZ suggested in a couple of key ways:

- 29.1 A blanket 50% trigger. INZ suggested the trigger should differ based on soil Plant Available Water.
- 29.2 A blanket 90% target refill point. INZ suggested a fixed application depth based on a minimum rotation for each irrigation system type.
- 30 In summary, while INZ agrees with the narrative GMPs it does not agree they require almost every irrigator to be practising deficit irrigation in terms of Overseer and effectively eliminate drainage arising from irrigation. INZ did not understand the GMP narratives to require this and engaged in discussions around the Farm Portal rules on this basis.

What is equitable?

- 31 INZ understands a key consideration for the implementation of GMP and therefore the Irrigation Rule within the Farm Portal is to ensure equity. This is underpinned by the equivalence principle contained on page 53 of the Matrix of Good Management project: Overview report². It is a way of avoiding poor performers benefiting by receiving higher N allocations. In effect, it places everyone on the same starting point.
- 32 From figure 57, page 72 of the 'Arable and horticultural crop modelling for the Matrix of Good Management - a technical summary' (Hume et al 2015)³, applying the system specific irrigation rules results in those running less efficient irrigation infrastructure, particularly on soils of medium to low PAW benefiting from not having modernised their irrigation systems. In fact, they will receive a double benefit, a higher GMP N-loss number and an additional option - upgrading their irrigation infrastructure - to achieve the any required future reductions. It could be said this approach is inequitable and also sends the wrong message. It penalises those who have been proactive and invested in modern irrigation infrastructure.

² http://ecan.govt.nz/publications/General/MGM_Overview_full_report_with_appendicies.pdf

³ http://ecan.govt.nz/publications/General/MGM_Arable_and_horticultural_crop_modelling_-_Hume_et_al_2015.pdf

- 33 INZ believes the Portal should assume everyone is undertaking a base level of GMP irrigation. This should not be specific to the irrigation system type they actually have right now, but a more objective and independent view of what would equate to GMP for a soil's PAW. For almost all soils, irrigation with a well-run sprayline irrigation system provides this equivalence. It provides an example of irrigating at GMP for the reasons explained by *Mr McIndoe*.
- 34 This means some of those who are using other irrigation system types operating poorly (below 80% application efficiency) – or for that matter a sprayline not operating at GMP – will need to make improvements just to achieve GMP. It also means those who have already invested in centre pivots and are running them well will be better than GMP. If they are in a catchment where reductions are required, they will already be achieving some of those reductions.
- 35 However, *Mr McIndoe* has explained that on some soils irrigation with a sprayline would not be good management practice. To say it is good practice everywhere would, therefore, not give effect to the industry-agreed GMPs. This would be inequitable. The Rule INZ favours reflects this.

The Proposed New Irrigation Rule

- 36 *Mr McIndoe* has outlined GMP Irrigation rules for range of irrigation systems in his evidence. INZ is proposing:
- 36.1 The sprayline GMP from his evidence replace Method s28.4 for all soils with 60mm or greater PAW; and
- 36.2 The centre pivot rules from his evidence replace Method 28.4 for all soils with 60mm PAW or less; and
- 36.3 Changes are made to the Irrigation and Water Use section of Table s28 so that appropriate reference is made to Method 28.4.

Table s28 GMP and Modelling Rules applied by the Farm Portal

Irrigation and water use	Manage the amount and timing of irrigation inputs to meet plant demands and minimise risk of leaching and runoff	<p>The following settings are applied to the Blocks – Irrigation Management page in OVERSEER for spray irrigation systems:</p> <p>Spray Irrigation</p> <p>In the section “Management Options”:</p> <ul style="list-style-type: none"> • The category “Based On” is set as ‘Soil Water Budget’ • The “Strategy” selected is ‘Trigger Point, Fixed Depth Applied’ • The “Management Systems” selected is ‘User Defined’ <u>and the ‘Depth per application’ and ‘Minimum Return Period’ are set in accordance with Method s28.4</u> • The “Units” is set at ‘%PAW’ • The “Trigger Point” is set at <u>‘50%’ in accordance with Method s28.4</u> <p>The following rules are also applied to cropping blocks:</p> <ul style="list-style-type: none"> • Irrigation occurs in accordance with Method s28.4 • No irrigation in fallow months • No irrigation of seed crops at time of harvest <p>No irrigation of grain, dried legumes, root vegetables and onions:</p> <ul style="list-style-type: none"> • In the final growing month of crop; or • If the total nitrogen uptake of the crop is > 96% 	All
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- 37 Adoption of this approach will provide an equitable bottom-line for all irrigators, including those that have already invested in capital upgrades. Their investment is able to be recognised during the sub-regional limit setting process.
- 38 The above approach also achieves or is better than the 80% application efficiency benchmark that INZ asked for in its submission, which is consistent with water quantity allocation policy.

Comments on the s42A Report

- 39 I have touched on many of the points made in Appendix D of the Section 42A report above.
- 40 Appendix D says “There was no recommendation from the workshop to model all systems as travelling irrigators” or for that matter another equivalent base irrigation system type such as sprayline. INZ believed

there was such an agreement. Further, that the rule would assume a fixed depth of application, not one dictated by the 50-90% moisture targets.

- 41 INZ was genuinely surprised by the Irrigation Rule in Schedule 28. During interactions between INZ and ECan representatives, ECan was adamant any Irrigation Rule had to be equitable – that it could not benefit one irrigation system over another (border dyke being the exception). Given this, when the travelling irrigator or equivalent rule was agreed at the September workshop, INZ had no reason to assume it would then be applied differentially.
- 42 This position is backed up by figure 57, page 72 of the 'Arable and horticultural crop modelling for the Matrix of Good Management - a technical summary' (Hume et al 2015)⁴ where it is evident the initial Irrigation Rule put forward by ECan representatives treated all irrigation systems equally, the exception being for soils of extremely low PAW as agreed by INZ.
- 43 The concern (at the top of page 56) regarding centre pivot application depths is a misinterpretation of INZ's submission. The submission is stating that a 50% trigger point would not be used for GMP centre pivot irrigation. This relates to the production risk. Typically, 50% of PAW is the point at which a crop experiences stress and production begins to be compromised. Irrigation systems are not designed to replace peak daily soil moisture losses during the irrigation season. The increased cost of the irrigation equipment, increase pipe size or pipe pressure rating and pump size, would be prohibitive. An inefficient allocation of water (take rate) would also result. Centre pivot irrigation systems in Canterbury are typically designed with 4 - 5 mm per day system capacities and a 3 - 4 day rotation length, whereas daily plant water use can be in excess of 6 mm per day at peak, although over a week this averages out to 35mm. To manage this risk a higher trigger point, such as 60% is used, although this trigger point will be soil type dependent.

⁴http://ecan.govt.nz/publications/General/MGM_Arable_and_horticultural_crop_modelling_-_Hume_et_al_2015.pdf

- 44 The ECan interpretation of the industry-agreed GMP's is a point of contention. The evidence of *Ian McIndoe* explains and provides evidence why 100% application efficiency is not a realistic expectation of irrigators.

Andrew Curtis
22 July 2016

Appendix 1: Requirements of SMART Irrigation

45 The requirements of SMART Irrigation are:

45.1 The irrigation system can apply water efficiently:

- (a) New developments and upgrades are consistent with industry codes of practice and standards
- (b) New developments and upgrades are commissioned
- (c) Irrigation system performance is checked annually

45.2 The use of water for irrigation is justified:

- (a) There is a demonstrable reason why irrigation was applied

45.3 Staff are trained

45.4 Evidence can be provided of the above

The irrigation system can apply water efficiently

46 This is achieved through:

Any new development, upgrade or redevelopment is consistent with the INZ Irrigation Design and Installation Codes of Practice and Standards

46.1 INZ has developed Codes of Practice and Standards for Irrigation Design⁵ and Installation⁶. Both of these were reviewed and updated between 2012 and 2014. They have been developed in collaboration with technical experts from the irrigation service industries and irrigators. INZ Accreditation Ltd was established in 2012 in part to introduce an accreditation programme for Irrigation Design Companies⁷. This first requires design companies to demonstrate they can achieve the

⁵ <http://irrigationnz.co.nz/industry/design/>

⁶ <http://irrigationnz.co.nz/industry/installation/>

⁷ <http://irrigationaccreditation.co.nz/>

standard through the application process. Accredited companies then agree (through a legal agreement) to adhere to the INZ Design and Installation Codes of Practice and Standards and be audited biannually with regard to this. The programme has been developed to give irrigators confidence that an accredited company will deliver an irrigation system design that meets the industry Codes of Practice and Standards. This will ensure it can deliver the required amount of water at the right time to maximise the production potential and importantly minimise environmental impacts.

A new development, upgrade or redevelopment is commissioned to demonstrate that it has achieved its design performance parameters

46.2 INZ produced a standard installation contract in 2013 and alongside this a commissioning template and guide was also produced in 2014⁸. Post discussions with the irrigation service industry a minimum expectations commissioning template is currently being produced and will be released in September 2016. The above allow the irrigation systems design performance parameters to be incorporated into the contract. These can then be used in the commissioning process to hold the installer/designer to account.

The irrigation system performance is checked annually to demonstrate it continues to perform efficiently

46.3 INZ updated the Evaluation Code of Practice in 2014⁹. It is now called the Irrigation Performance Assessment Code of Practice¹⁰. Within this, annual performance assessment methods for all irrigation system types have been collated and documented. The outcomes from the annual performance assessment should be compared to the original design performance parameters in the commissioning report. If anomalies are observed they should be rectified, alternatively if there is uncertainty as to the issue a full independent evaluation

⁸ <http://irrigationnz.co.nz/news-resources/irrigation-resources/>

⁹ <http://irrigationnz.co.nz/industry/performance-assessment/>

¹⁰ <http://irrigationnz.co.nz/industry/performance-assessment/>

should be undertaken. Such an approach makes economic sense, ensuring the irrigation system is operating correctly is an essential risk management strategy for production.

The use of water for irrigation is justified

There is a demonstrable reason why irrigation was applied.

- 47 Firstly it is important that irrigation applications are consistent with any consent conditions. These are a legal requirement and must be adhered to. There are a number of ways the need for irrigation can be demonstrated. Soil moisture monitoring provides one pathway and is becoming more commonly used (now around 15-20% of users), although it is not applicable for all scenarios. A water budget (climate and soil data combined with irrigation applications) provides another. There are also crop models available. For irrigation applications that are not triggered through plant induced soil water deficits, other evidence should be provided – for example for frost protection temperature records should be kept.

Staff are trained

- 48 To support and enable all irrigators to achieve SMART Irrigation, INZ has developed an Irrigation Resource Kit - 'Irrigation in a Box'¹¹ and associated training courses. The resources provide a comprehensive range of information books to assist with irrigation management and development, irrigation system pre-season checklists, annual performance assessment materials and a range of other information – a one stop shop for irrigators. INZ run a number of 2-hour workshop and one-day irrigation manager and development training courses¹². Attending the day allows irrigators to practically understand SMART Irrigation. They also receive a complimentary Irrigation Resource Kit.

Proof can be provided

- 49 The provision of auditable evidence is key to providing accountability and establishing trust. SMART Irrigation now forms the basis of the irrigation module of Farm Environment Plans.

¹¹ <http://irrigationnz.co.nz/news-resources/irrigation-resources/>

¹² <http://irrigationnz.co.nz/events/>